NOTE XLV.

DESCRIPTIONS OF EARTHWORMS.

BY

Dr. R. HORST.

VII.

On Malayan Earthworms.

(Plate 10).

The earthworms, described in the present paper, are for the greater part collected by Dr. H. ten Kate, during his journey in the Malay Archipelago in 1891, in the isles of Flores, Timor, Samao, Groot-Bastaard and Soemba. I added the description of some other ones from Java, Sumatra and Borneo, for which I am indebted to the kindness of dr. Vorderman, dr. J. F. van Bemmelen, dr. J. G. Boerlage, dr. J. Bosscha en dr. Hagen. As could be expected, a great number of those worms belong to the genus *Perichaeta.* Though the discrimination of the species of this large genus is a very difficult task, I undertook to add seven new species to it, bringing the total number of Malayan *Perichaeta*-species up to thirty-three.

Perichaeta falcata n. sp.

Two specimens, collected by dr. ten Kate at Sikka in East Flores.

A rather thick, stout worm, of a yellowish brown colour. The largest specimen measures about 120 mm. in length. The circles of setae are disposed along a distinct, whitish ridge. On the clitellum neither intersegmental grooves nor setae are visible. Segments IX—XIII have a great longitudinal diameter, a third longer than that of the foregoing segments.

The rectangular prostomium extends back over the half of the buccal segment.

The spermathecal pores are distinct, semilunar fissures, situated in the inter-segmental grooves VII/VIII and VIII/IX, on each side of the belly.

The oviducal pore is situated upon a white area in segment XIV.

The male pores lie upon a large, transverse, oval papilla, extending forward and backward till segment XVII and and XIX. Dorsal pores are only recognizable behind the clitellum. There are about 60 setae on the segments in front of the clitellum.

The 8th, 9th and 10th septa are absent. The gizzard occupies segments IX and X; the intestinal coeca of segment XXVI are conical, moderately developed. Two pairs of spermathecae in segments VIII and IX; each of them (fig. 1) consists of a broad, oval pouch with a short, wide duct and of a thick, falcate diverticulum, that is nearly as long as the pouch, the diverticulum communicates with the main pouch by a short and narrow, S-like bended duct. The diverticulum of the anterior spermatheca sometimes lies in front of the septum, in segment VII.

The prostate is a highly lobulated gland, opening on the exterior by a muscular duct, as usually bent upon itself and provided with a dilated sac at its extremity.

Though already nine species of *Perichaeta*, furnished with two pairs of spermathecae, have been described from the Malay Archipelago, our specimens could not be identified with one of them.

? *Perichaeta sangirensis* Michaelsen.

One specimen, collected by dr. ten Kate at Sikka in East Flores.

Among the *Perichaeta*-specimens from Flores there is one individual, showing only two spermathecal pores in the intersegmental groove VII/VIII. It is a slender worm, tapering posteriorly, and measuring 140 mm. in length; in the middle region of the body the intestinal canal is visible through the transparent body-wall.

The cephalic lobe is distinct, extending over two thirds of the buccal segment.

The first dorsal pore is visible in the groove between segments XI and XII.

The spermathecae occupy segment VII; they consist (fig. 2) of a long pyriform sac, provided with a short and wide excretory duct; a small, globular diverticulum communicates by a short and narrow tube with the main pouch.

The prostata is divided by a deep fissure in two halfs, which consists each of numerous small lobes, separated from each other by shallow grooves. On the segments in front of the clitellum about 40 setae can be counted.

This specimen shows no resemblance to another Perichaeta-species from Flores, described by myself in an earlier paper [1]; perhaps it will be identical with *P. sangirensis* Mich [2].

Perichaeta posthuma Vaillant.

Eight specimens, collected by dr. ten Kate in the island Groot-Bastaard.

Perichaeta sp.

One specimen, collected by dr. ten Kate in the island Groot-Bastaard.

Besides the specimens of *P. posthuma*, dr. ten Kate collected in the island Groot-Bastaard another earthworm, belonging also to the genus *Perichaeta*; unfortunately this specimen is badly preserved. It is a rather slender worm, measuring about 90 mm. in length. The buccal region of the oesophagus is everted, therefore the cephalic lobe could not be recognized. The clitellum is distinct, without setae.

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[1] Earthworms from the Malay Archipelago; Max Weber, Zoolog. Ergebnisse einer Reise in Niederl. Ost-Indien, Bd. II, 1892, p. 70, pl. III, fig. 28.

[2] Jahrbuch Hamburg. Wissensch. Anstalte, VIII, 1891, p. 36.

The male generative pores are situated upon distinct papillae; there are 10 setae between them. On the segments XIX, XX and XXI a pair of cub-shaped papillae are visible, corresponding to the line of the male pores. External orifices of spermathecae could not be recognized; neither was there internally a trace of these organs to be found. The internal structure is as usually. Perhaps this specimen must be referred to *P. Forbesii* Bedd.[1]; however this species also possesses papillae on segment XVIII.

Perichaeta variabilis n. sp.

Eight specimens, collected by dr. ten Kate in the north of the island Soemba.

A rather thick, stout worm, with a cylindrical body of a yellow-brown colour. The length of the largest specimen is about 160 mm. The prostomium extends back till the half of the buccal segment. The clitellum is distinct, showing neither setae nor intersegmental grooves. The setae are arranged in a continuous circle, only interrupted in the median dorsal line; on the segments in front of and behind the clitellum about 54 of them are visible, situated upon a prominent ridge.

There are no copulatory papillae. Two pairs of spermathecal pores are situated laterally, in the intersegmental grooves VII/VIII and VIII/IX; an unpaired oviducal pore on segment XIV.

The male pores on segment XVIII, situated upon distinct papillae, lie in the line of the seventh seta from the ventral median line; eight setae could be counted between both pores. First dorsal pore behind the clitellum.

These worms present a singular variability in the structure of their genital organs. The spermatheca (fig. 3) consists of a large globular pouch and a long diverticulum, showing several windings like a corkscrew; however often this diverticulum is pourly developed, extending scarcely till the half of the pouch' and is wound not at all or hardly so (fig. 3*a*). In four specimens, which I examined, both spermathecae of the dextral side presented such a faintly developed diverticulum; however it was also observed at the left side.

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[1] Proc. Zoolog. Society, 1890, p. 65, pl. IV, fig. 5.

The prostata also shows a divergency from the usual structure; it is a small, faintly lobed gland, of a rudimentary appearance, extending forward and backward not much beyond its muscular duct. I thought first to have to do with a species, which perhaps was allied with the japanese *Perichaetae* [1]), described by Beddard, which have the prostata entirely wanting; however in one of the four specimens, which I examined, I found at the ventral side a well-developed prostata, extending as usually over three segments. It may be presumed therefore, that the other worms were not in a state of sexual maturity.

In the other parts of its organisation no peculiarities could be observed; the eight and ninth septa are absent, those of segments XI, XII and XIII are rather thick.

A bell-shaped gizzard occupies segments IX and X; a long, digitiform coecum lies in segment XXVI and extends forward over five segments.

There are two pairs of tongue-shaped vesiculae seminales in segments XI and XII, connected with each other and including the ciliated funnels. A large fan-shaped ovary is attached at the anterior septum of segment XIII.

The specimens could not be referred to one of the Malayan *Perichaeta*-species already known, though three species from this region are described, which possess also two pairs of spermathecae with a long, wound diverticulum i. e. *P. musica* Horst (Java), *P. longa* Mich. (Sumatra) and

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1) Zoolog. Jahrbücher, Systematik, Bd. VI, 1893, p. 755.

P. fasciata Rosa (Engano). *P. longa*, as stated by Michaelsen, much resembles *P. musica* and is only distinguished by the shape of the male pores and the smaller number of setae; perhaps both species are identical, for the shape of the male pores appears to me not to be constant and as already stated in my earlier paper, in small specimens of *P. musica* the number of setae amounts only to 60 or 70. Our species from Soemba appears to be distinguished from *P. fasciata* and *P. musica* as well by a smaller number of setae as by a different situation of the male pores.

Perichaeta Tenkatei n. sp.

Three specimens collected by Dr. ten Kate at Wamgapoe in the North of the island Soemba.

Besides the preceding species three other *Perichaetae* were collected in Soemba, which are distinguished by their more slender appearance, tapering anteriorly and posteriorly.

The body measures 85 mm. in length; the number of segments is about 100. The clitellum shows distinct dorsal pores, not visible in the preceding species; the first dorsal pore lies in the intersegmental groove XI/XII. The prostomium extends back over the half of the buccal segment. The setae are arranged in a continuous row, upon a distinct ridge; there are about 50 of them on the segments in the vicinity of the clitellum, but none on the clitellum itself.

Two pairs of spermathecal pores lie at the ventral side of the body in the intersegmental grooves VII/VIII and VIII/IX. The male pores, situated on large papillae, present themself as semilunar fissures, surrounded by a border, the half of which is crenulated, while the other half forms a lid, that covers the pore, like with *P. capensis* (*operculata* Rosa). ¹)

The spermathecae (fig. 4) strike the eye by the large-

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1) Exotische Terricolen; Ann. K. K. Naturhist. Hofmuseums, Wien, Bd. VI, 1891, pl. XIV, fig. 6.

ness of their diverticulum, which occupies a great portion of the segment; each of them consists of a thin, folded sac, with a short duct, and of a large U-shaped, muscular diverticulum, which is much longer than the main sac and near its distal end suddenly narrows and terminates in a globular vesicle.

The eight and ninth segments are absent. The gizzard, occupying segments IX and X, is bell-shaped, not very long. The intestinal coeca of segment XXVI, are not very large, extending over four segments. Two pairs of large seminal vesicles occupy segments XI and XII. In segment XIII, attached to the anterior septum above each ovary, a comma-shaped body was observed; perhaps they represent a second pair of receptacula ovorum, as found by Beddard in *P. mauritiana.* [1]

Perichaeta capensis Horst. [2]

Specimens were collected in Timor by Dr. ten Kate, at Buitenzorg by Dr. Boerlage and at Tjibodas by Dr. van Bemmelen.

Perichaeta urceolata n. sp.

Ten specimens were collected by Dr. Vorderman in the Lampongs (Sumatra).

A slender worm, tapering at its anterior and posterior extremity, of a pale yellow-brown colour, with the zones of setae whitish. The largest specimen measures 110 mm. in length. The cephalic lobe reaches back till the half of the buccal segment, which is small. The clitellum is distinct, devoid of setae.

The spermathecal pores are represented by a pair of distinct fissures, situated laterally in the intersegmental groove V/VI.

A single oviducal pore on a white area. The male pores are plain fissures, not surrounded by a wall, situated in the series of the 7th seta; there are 12 setae between both pores.

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[1] Proc. Zoolog. Society, 1892, p. 170, pl. X, fig. 5.

[2] Loc. cit. p. 62, pl. III, figs. 24—26.

The circles of bristles are continuous, except in the dorsal median line; there are 36 à 40 of them upon each segment.

The spermathecae (fig. 5), situated in segment VI, consist of a rather large, urceolate pouch and of a bended, tubular diverticulum, that reaches till about two thirds of the main pouch and before opening in it suddenly narrows. I found the diverticulum, as usually, entirely filled with sperma, whereas the pouch contained sand and other strange material, giving it a blackish colour.

In one specimen another pair of spermathecae, smaller than the anterior ones, was observed in segment VII, opening in the intersegmental groove VI/VII.

As to its internal structure this species agrees with other *Perichaetae*; a well-developed prostata is present, provided with a S-like bended duct, terminating in a dilated sac. In some specimens this dilated part is protruded to the exterior. There are in segments XI and XII two pairs of large, tongue-shaped seminal vesicles, each with a hooked appendage at the distal extremity. Long intestinal coeca occur in segment XXVI.

Several *Perichaeta*-species, provided with only a single pair of spermathecae, are already known, as well from the Malay Archipelago (*P. quadragenaria* Perr., *racemosa* Rosa, *P. sangirensis* Mich., *P. minima* Horst, *P.* sp. from Flores) as from other isles in the Indian and Pacific Ocean (*P. novarae* Rosa, *P. vitiensis* Bedd., *P. taprobanae* Bedd., *P. pulchra* Mich.); but with none of these species the Perichaetae from the Lampongs could be identified, because all those species have not only spermathecae of a different shape, but their spermathecal pores lie also more backward. With *P. minima* those pores are situated on segment VII, with *P. racemosa* in the intersegmental groove VIII/IX and with the other ones in the groove between segment VII and VIII.

Perichaeta Martensi Michaelsen.

A single specimen from the Lampongs (Sumatra), collected by Dr. Vorderman.

Among the specimens of *P. urceolata* I met with an individual, provided with four pairs of spermathecae, which agree in their structure with the spermathecae of *P. Martensi* (from Banka), as described and figured by Michaelsen [1]). The charasteristic of those organs is, that the slender, club-shaped diverticulum possesses another small, globular, sessile diverticulum; in our specimen the greater part of spermathecae showed this character, however in three of them it was absent. It seems to me liable to question wether *P. Martensi* must not be considered a variety of *P. indica*, for in my paper on Sumatra-earthworms [2]) I pointed out, that in some specimens of this species (from Soepajang) the tube of the diverticulum in the middle of its length possessed another tubular appendage.

Perichaeta Bosschae n. sp.

A single specimen, collected by dr. Bosscha in Sambas, Borneo.

I received two *Perichaeta's* from Borneo, but one of them was not in a state of sexual maturity and could therefore not be identified; the other one appears to me to belong to a new species. It is a rather large worm, dark-brown over the total surface of the body, with white circles of setae; its length is 170 mm. The number of segments is 125. The cephalic lobe distinct, extending back over two-thirds of the buccal segment. A dark-coloured clitellum, without setae. The male pores have the shape of fissures, only surrounded by a faint wall; the oviducal pore is single. Four pairs of spermathecal pores

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1) Archiv für Naturgesch. 1892, p. 34, pl. XIII, fig. 20.

2) Midden-Sumatra, reizen en onderzoek. der Sumatra-expeditie, 1877—79, Natuurl. Hist., Dl. IV, 2, Pl. 1, fig. 1*b*.

are situated laterally in the intersegmental grooves V/VI, VI/VII, VII/VIII and VIII/IX. The first dorsal pore lies in the groove between segments XII and XIII. There are no copulatory papillae. Each spermatheca (fig. 6) consists of a rather large, oval sac, with a distinct, tubular duct and a small oblong, pyriform diverticulum, as long as the excretory duct. The prostata is a fan-shaped, compact (not lobed) gland, with a short, thick muscular duct. Of the intestinal coeca in segment XXVI only that of the left side could be observed; it is a rather long appendage, faintly lobed at the external side of its inferior half, like in *P. mandhorensis* Mich. [1]). The remaining structure shows no pecularities.

This specimen could not be referred to one of the known Malayan species, which are also provided with four pairs of spermathecae. In *P. neoguineensis* Mich. whose spermathecae are also provided with a small diverticulum, the spermathecal pores at the ventral side are situated so next to each other, that the distance between both spermathecae of the same segment is smaller than that between the spermathecae of two succeeding segments; moreover the intestinal coeca appear to be absent. *P. enganensis* Rosa and *P. Modiglianii* Rosa have their spermathecae provided with a long diverticulum, while in *P. Martensi* Mich. and *P. indica* Horst these organs have a totally different shape. *P. posthuma* Vaill. and *P. Vordermanni* Horst possess copulatory papillae in the vicinity of the male pores.

Perichaeta longa Michaelsen.

A single specimen from Tjibodas (Java), collected by Dr. van Bemmelen.

A mutilated worm, only 65 mm. long, wanting its posterior end, appears to be referable to Michaelsen's *P.*

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1) loc. cit. Pl. XIII, fig. 19.

longa, though the dimensions of his specimen are much greater. The spermathecae agree very well with Michaelsen's figures, only their blind end has a more dilated, tongue-shaped appearance.

Perichaeta tjibodae n. sp.

Two specimens from Tjibodas (Java), collected by Dr. van Bemmelen.

Among the worms, collected at Tjibodas, there are two specimens, which, though resembling in many respects *P. capensis* Horst (— *operculata* Rosa), cannot, as I believe, be identified with that species. The smallest example has a length of about 50 mm.; the largest one is incomplete. The colour is olive-brown; the anterior end of the body with the clitellum is greyish.

The cephalic lobe with a broad appendix extending back till the half of the buccal segment. Clitellum distinct, without setae. Two pairs of spermathecal pores, situated entirely ventrally, in the intersegmental grooves VII/VIII and VIII/IX; the distance between the pores of one segment hardly $1^1/_2$ times that between the pores of two succeeding segments. The pores of a pair are connected together by an indistinct, transverse, glandular area (fig. 7). Oviducal pore single on segment XIV; male pores on segment XVIII, triradiate, as the mouth of a leech, separated by a deepened area, extending over the segment in front and that behind.. Setae in a continuous ring, 44 in number. Eight setae between the male pores. No copulatory papillae. The spermathecae (fig. 7*a*) are very large; the first pair lie in segment VIII, the second one in segments VIII and IX, extending along the total length of the gizzard. Each spermatheca consists of a large, globular sac with a short excretory duct and of a tubular diverticulum, terminating in a small, oval vesicle; this diverticulum is curved like a horn and extends along the superior half of the main sac. The sac shows a yellowish colour and is of a hard consistency, as if its wall contained chitine; however on traverse sections it appears to have a normal structure and its hardness to be only due to a secretion, probably coagulated by the influence of alcohol. The diverticulum possesses a thick, muscular, folded wall.

The prostata is a large gland, consisting of numerous lobes and extending over segments XVI—XXII; its excretory duct is longer than it is ordinarily the case with Perichaetae and therefore it is curved, as shown in fig. 7*b*; the first part of the duct, in which the vas deferens opens, near its origine from the prostate, is membranaceous; next to the ventral median line, before turning back, it passes into the muscular part, which terminates in a dilated sac. The internal structure as usually.

Two pairs of tongue-shaped seminal vesicles in segments XI and XII. There is a bell-shaped gizzard in segments VIII and IX; the short conical, intestinal coeca of segment XXVI extend over four segments. Three pairs of abdominal hearts occupy segments XI, XII and XIII.

In the shape of the spermathecae and the ventral position of their external orifices this worm much agrees with *P. operculata* Rosa (= *capensis* Horst). However according to Rosa's description this species is distinguished by its small cephalic lobe, without posterior appendix, which is coalesced with the buccal segment; moreover its prostata-duct is short and straight.

Perichaeta inflata n. sp.

A single specimen from Tjibodas, collected by Dr. van Bemmelen.

A small worm, measuring only 55 mm. in length. Its body tapering at the anterior and posterior end, is of a yellowish brown colour; the clitellum is darker. A rather large, rectangular prostomium extends back till the half of the buccal segment.

Two pairs of spermathecal pores in the intersegmental grooves VII/VIII and VIII/IX; the male pores are represented by fissures, with a crenulated border and surrounded by a glandular wall. There are no copulatory papillae.

The setae are arranged in a continuous circle, upon a prominent ridge of white colour; no setae on the clitellum. Two pairs of spermathecae; each of them (fig. 8) consists of a not very large, globular sac, with short duct and of a diverticulum, represented by a long, slender, twisted tube, which terminates in a small pyriform vesicle. Before terminating in this vesicle thee tube shows a large, oblong dilatation. The prostata is a rather large gland, consisting of numerous lobes, and opening on the exterior by a straight, narrow, membranaceous duct, which terminates in a dilated sac.

This species appears to be allied to *P. fasciata* Rosa from Engano.

Perichaeta musica Horst.

A single specimen from the Gedeh (Java), collected by Dr. Vorderman.

This specimen has a singular appearance, being rather stout but very short. The diameter of the body in front of the clitellum is 17 mm.; its length is only 21 cm. The number of segments is about 65.

Pontoscolex corethrurus F. Müller.

Several specimens from the Lampongs (Sumatra), collected by Dr. Vorderman.

Benhamia malayana Horst.

Two specimens from Poeloe Samao, by Dr. ten Kate; one specimen from Tandjong Morawa (Sumatra) by Dr. Hagen.

Benhamia floresiana Horst.

Two specimens from Amarassi in Timor, collected by Dr. ten Kate.

Benhamia Annae Horst.

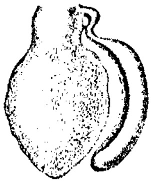
Three specimens from Buitenzorg, collected by Dr. van Bemmelen.

EXPLANATION

OF

Plate 10.

Fig. 1. *Perichaeta falcata:* Spermatheca. × 11 diam.
Fig. 2. *?Perichaeta sangirensis:* Spermatheca. × 15 diam.
Fig. 3. *Perichaeta variabilis:* Spermatheca of the left side; 3*a* spermatheca of the right side. × 8 diam.
Fig. 4. *Perichaeta Tenkatei:* Spermatheca. × 8 diam.
Fig. 5. *Perichaeta urceolata:* Spermatheca. × 8 diam.
Fig. 6. *Perichaeta Bosschae:* Spermatheca. × 10 diam.
Fig. 7. *Perichaeta tjibodae:* Ventral view of segments VII–IX and XIV—XIX; 7*a*. Spermatheca; 7*b*. Prostata. × 8 diam.
Fig. 8. *Perichaeta inflata:* Spermatheca. × 12 diam.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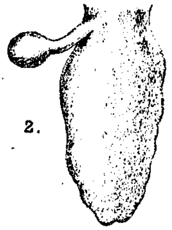
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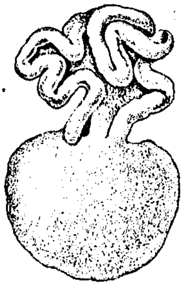
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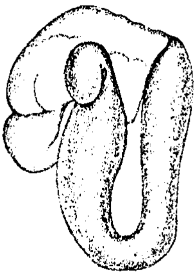
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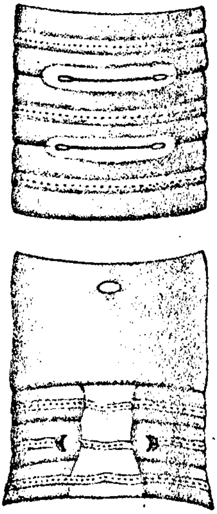
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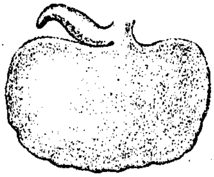
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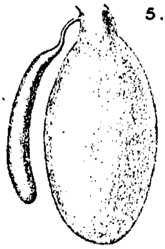
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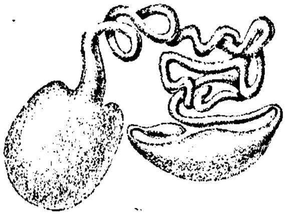
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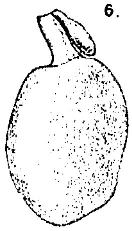
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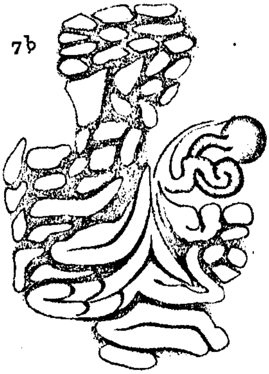
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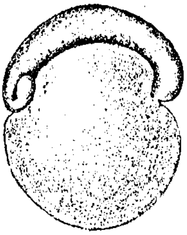
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Dr. R Horst ad nat. del. A. J. J. Wendel lith. P. W. M. Trap impr.

1. Perichaeta falcata *Horst.*
2.? „ sangirensis *Mich.*
3. „ variabilis *Horst.*
4. „ Tenkatei *Horst.*
5. Perichaeta urceolata *Horst.*
6. „ Bosschae *Horst.*
7. „ tjibodae *Horst.*
8. „ inflata *Horst.*